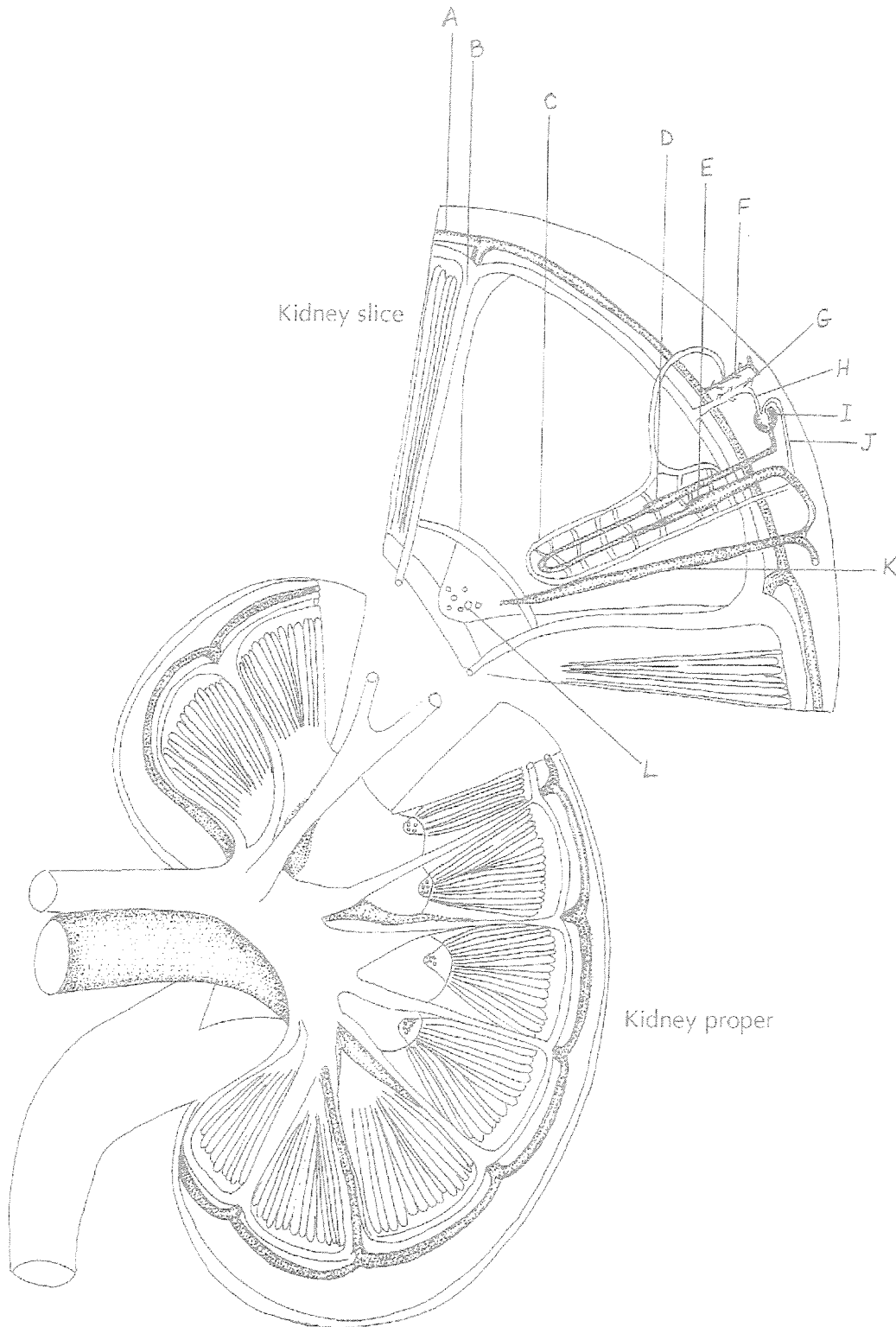


10-5. THE ANATOMY OF THE NEPHRON

Instructions: (1.) Label the diagram. (2.) Answer the questions and follow the special instructions at the end of each statement. *Note:* You will need map pencils or markers.



Label the following arrows:

- | | |
|---------------------|-----------------------|
| A arcuate vein | G interlobular artery |
| B arcuate artery | H afferent arteriole |
| C capillary net | I Bowman's capsule |
| D proximal tubule | J efferent arteriole |
| E distal tubule | K collecting duct |
| F interlobular vein | L papilla |

Many scientists classify the kidney as a tubular gland, because each kidney contains over one million filter tubes called "nephrons." Usually, these nephrons are lined up in the renal pyramids; this arrangement gives the pyramids their characteristic shape.

The diagram is in two parts. They are labeled "Kidney Proper" and "Kidney Slice." The kidney slice shows an enlargement of a renal pyramid and includes one nephron and its associated structures. It is important for you to realize that these structures are greatly enlarged; they would look much smaller in an actual kidney.

Statements

1. A fraction of the blood that travels down the descending aorta enters the kidney through the renal artery. As the renal artery enters the kidney, it branches to form loops around the renal pyramids. These loops are called "arcuate arteries."
 - a. Does all the blood that passes down the aorta enter the renal artery? _____
 - b. The loops that direct blood around the renal pyramids are branches of the _____ artery.
 - c. Use a red pencil to color the renal artery and the arcuate arteries.
2. From the arcuate arteries, blood travels up short tubes called "interlobular arteries."
 - d. Which arrow points to an interlobular artery? _____
 - e. Notice that the top branch of the interlobular artery attaches to the nephron and that the remaining branches have been cut. How many cut branches do you see on the interlobular artery?

 - f. What do you think the remaining branches of the interlobular artery would attach to if they had not been cut?

3. Incoming blood travels into the Bowman's capsule through the afferent arteriole. Arrow H points to the afferent arteriole.

g. Where does the afferent arteriole send blood?

h. Which arrow points to the Bowman's capsule? _____

4. Five tightly wrapped tubes lie inside the Bowman's capsule. These tubes are collectively called the "glomerulus." Water, wastes, and small molecules of other substances pass through small pores in these tubes to enter the proximal tubule. Since this is a filtering process, all the substances passing through these pores are called the "glomerular filtrate."

i. How many tubes are in the Bowman's capsule? _____

j. What are these tubes called?

k. List three substances in the glomerular filtrate.

5. The two main sections of the loop of Henle are the proximal tubule and the distal tubule.

l. How many main segments are in the loop of Henle? _____

m. Which arrow points to the proximal tubule? _____

n. Which arrow points to the distal tubule? _____

o. Use a blue pencil to color the loop of Henle.

6. The remaining plasma and blood cells, and any molecules that are too large to pass through the glomerulus, leave the Bowman's capsule through a tube called the "efferent arteriole"; it directs these components into the capillary net.

p. Describe what happens to the remaining plasma and blood cells and to large molecules that do not pass through the pores of the glomerulus.

q. Which arrow points to the capillary net? _____

7. Many essential substances such as water, sodium ions, and chlorine ions pass through the glomerulus as part of the filtrate. Because these substances are needed by the body, they leave the loop of Henle to rejoin the blood cells in the capillary net. This process is called "reabsorption."

- r. List three essential substances that pass through the glomerulus along with the filtrate.

- s. Why is it important for these substances to leave the loop of Henle?

8. Wastes remaining in the loop of Henle travel through the distal tubule to enter the collecting tube. The collecting tube directs the wastes—now called “urine”—to the base of the pyramid where it drips through small holes into the pelvis of the kidney. These wastes leave the pelvis through the ureters—large tubes that direct urine to the bladder.

- t. From the distal tubule, where is blood sent?

- u. Where do the ureters take urine?

9. Cleaned blood in the capillary net is sent through the interlobular vein, which eventually leads to the renal vein. Cleaned blood leaves the kidney through the renal vein and joins the blood in the inferior vena cava. The inferior vena cava directs the blood to the heart.

- v. Describe how cleaned blood leaves the kidney.

- w. Where does the inferior vena cava send this blood?
